Supplement to C&GS Special Publication No. 215

Manual of Current Observations

Revised (1950) Edition

Date of Supplement—November 1961

The Coast and Geodetic Survey has made many changes in the methods used to observe, record and process currents since the publishing of the Manual of Current Observations in 1950. Several of the more important changes are given in this supplement. It is suggested that the user of this Manual take his copy and mark those sections or tables for which new or revised material is given in this supplement. New material is given for the following sections:

Section 82, page 30—In the radio current meter a rotating impeller, actuated by the current, is connected through a magnetic drive to an enclosed interior mechanism which opens and closes an electric circuit by means of two contacting devices. One lever mounted on the compass is always oriented magnetic North. The other, fixed to the meter, is always oriented in the direction of the current flow.

A post, carried on a gear, revolves past the switch-actuating levers and causes the lever mounted on the compass shaft to close its switch contacts once for each revolution of the gear (5 revolutions of the impeller). Each contact produces a radio signal. The frequency of these signals is determined by the velocity of the impeller and therefore can be translated into current velocity through use of the special rating table.

The post, as it revolves, is also rotated so that on every second revolution, a portion of it, which is eccentric, misses the lever fixed to the meter. Therefore the fixed lever closes its switch contact only once for each two revolutions of the gear (10 revolutions of the impeller). The radio signals thus produced occur at half the frequency of the velocity signals. Their relationship in time to preceding and following velocity signals indicates the angle between the compass and the meter axis, thus determining the direction of the current.

In 1958 the Roberts radio current meter was modified by the addition of larger impellers and tail fins made out of $\frac{1}{16}''$ fiberglass. Known as the Model IV low velocity meter to distinguish it from the older conventional Model III high velocity meter, the modification makes it possible to measure accurately current velocities as low as 0.1 knot. Supplement Figure No. 1 is a photograph of the Model IV Roberts radio current meter.

Section 83, page 30—In operation, a maximum of three current meters can be suspended below an anchored buoy. A sequence switch, carried in the buoy, selects in proper order one meter at a time for transmitting. The buoy also houses a radio transmitter, complete with batteries, which is connected electrically with the meter and with an antenna mounted on the buoy. The velocity and direction contacts are relayed as radio signals by the transmitter to a receiving station. "AM" radio gear has been used in the transmission of current signals from the buoy to the receiving station since the system was first developed. An example of the chronograph tape showing the

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velocity and direction pips as recorded is shown in Supplement Figure No. 2. In 1958 "FM" radio gear was introduced to obtain separate velocity and direction radio signals, which are recorded by a 3-stylus chronograph. An example of the tape is shown in Supplement Figure No. 3. A new edition of the Roberts Radio Current Meter Manual will be issued describing the "AM" and "FM" radio equipment as well as other changes in current observing instruments.

It should be emphasized that the meter model used at a current station is not determined by the type of radio equipment available on the ships. Either current meter (Model III or Model IV) can be used with either the "AM" or "FM" radio equipment. Care should be taken, however, to use the correct rating table when scaling the chronograph tapes. Present plans call for a straight rather than an eccentric post in the Model IV meter when used with "FM" radio equipment in order that the number of direction signals may be doubled. This requires particular care in wiring circuits as the identifying 2 to 1 ratio of signals is eliminated.

Figure 21, page 31—This diagram shows a sample suspension when one Roberts radio current meter is used at a station. Supplement Figure No. 4 shows three current meters suspended from the current buoy.

Figure 24, page 34—Delete this page and substitute Supplement Figures Nos. 2 and 3.

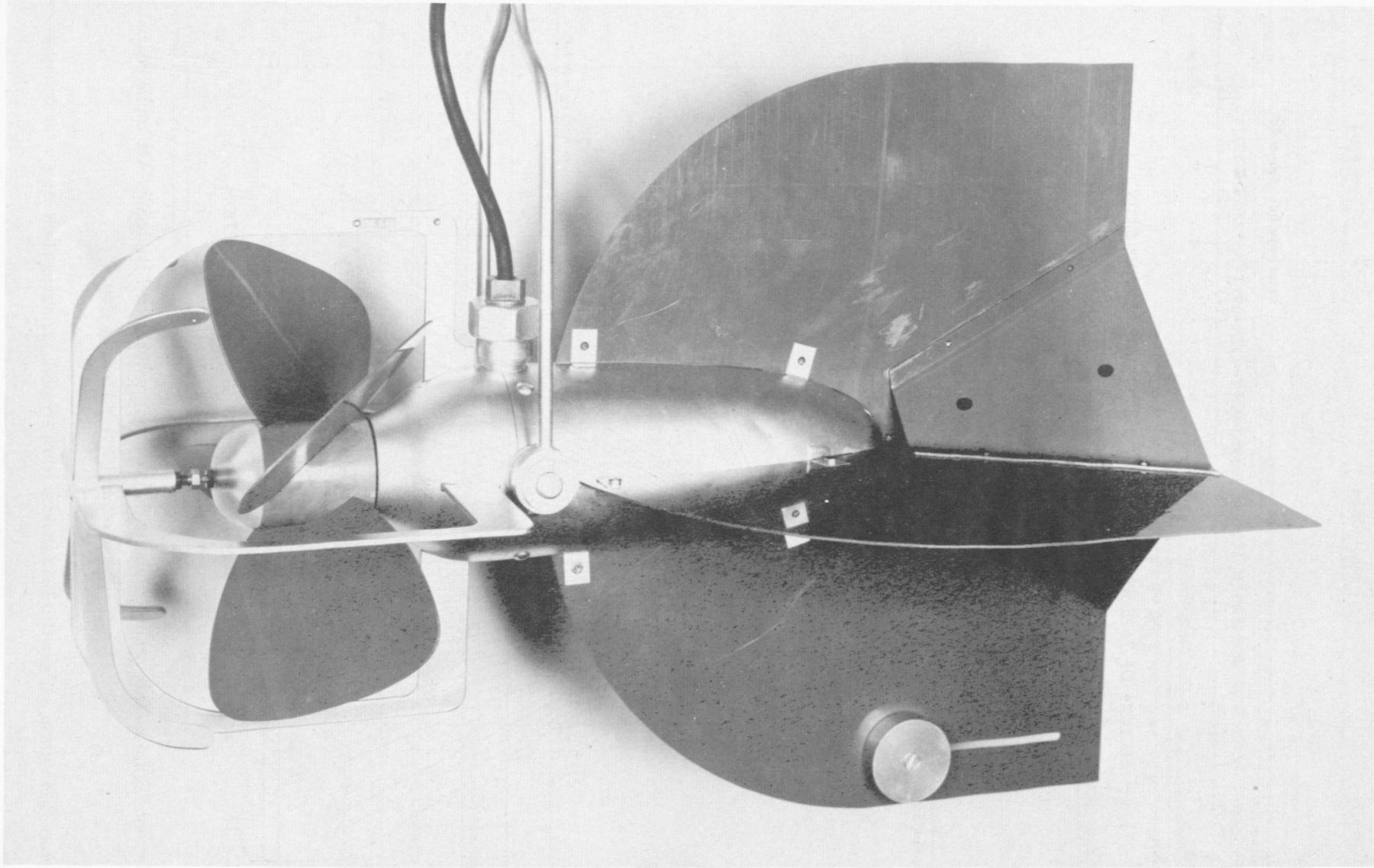
Section 87, page 35—Delete the entire paragraph as well as Table 5 on page 50 and substitute the following material:

Results of calibrations of both Model III and Model IV Roberts radio current meters show a sufficient uniformity to justify the use of a single rating table for each meter. Rating tables for Model III and Model IV radio current meters now being used by C&GS field parties are included in this supplement as Supplement Figures Nos. 5 and 6.

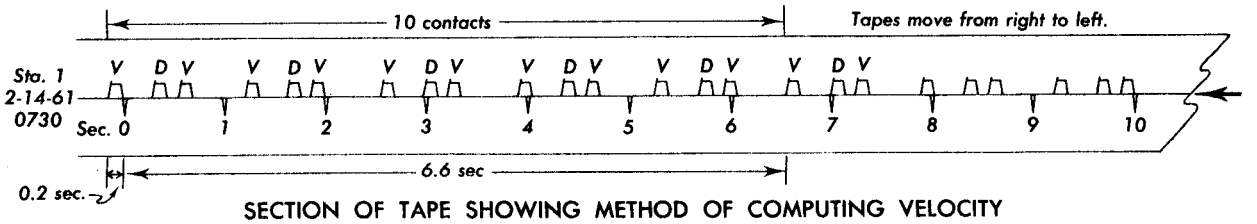
Section 111, page 42—Form 270 "Record of Current Observations." Supplement Figure No. 7 is a sample page showing the correct way to enter the velocity and direction of the current as observed by Roberts radio current meter. In addition to the information required to be entered in each record book for each station, the observer should also record the serial number and model number of each current meter used at that station.

Table 5, page 50—Rating table for Roberts radio current meter—Do not use this table but refer to Supplement Figures Nos. 5 and 6. Figure 5 is to be used with the standard Model III meter and Figure 6 with the Model IV meter.

Section 141, page 53—A revised (Oct. 19, 1959) edition of Form 451 is now being used in the office reduction of reversing currents. Supplement Figure No. 8 is an example of the completed form.



Supplement Figure 1.–Modified Roberts radio current meter, Model IV.



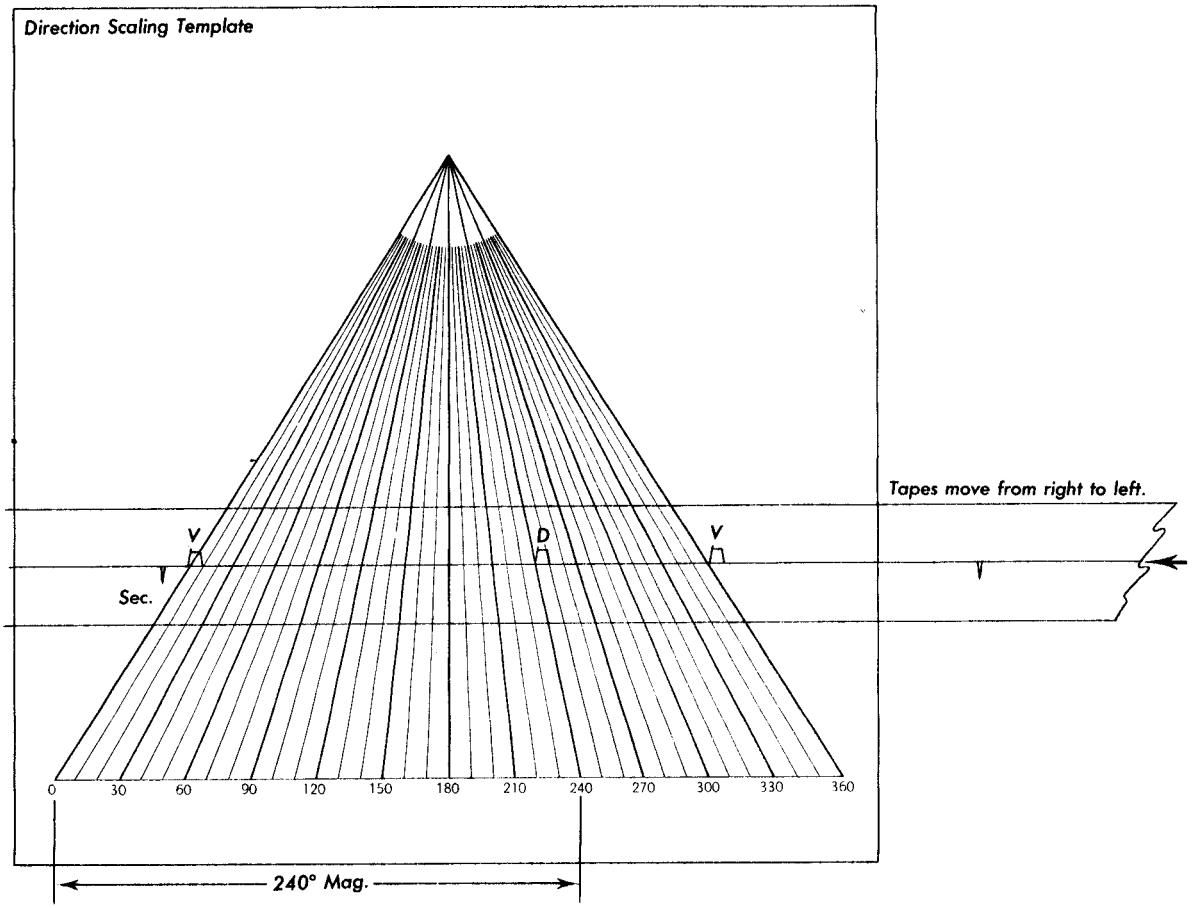
SECTION OF TAPE SHOWING METHOD OF COMPUTING VELOCITY

Total time 6.8 sec.

Total contacts 10

Contact interval=6.8 sec./10=0.68 sec.

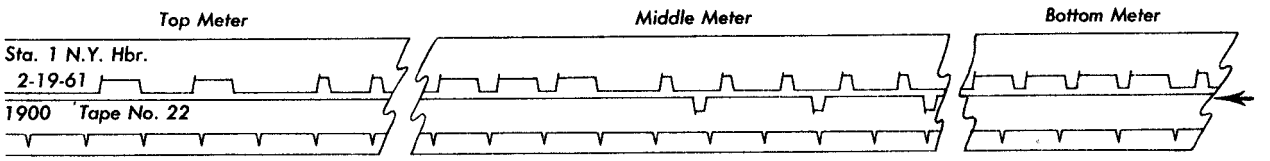
From Rating Table for Roberts current meter, Model III Vel.=5.2 knots



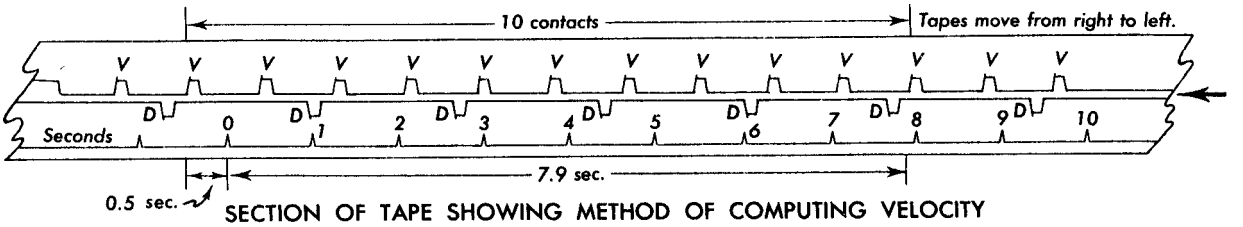
SECTION OF TAPE SHOWING METHOD OF SCALING DIRECTION

Direction=240° Mag. (approx.) (scaled)

Supplement Figure 2.-Tape scaling, Roberts radio current meter, Model III, using "AM" radio gear.



EXAMPLE OF CURRENT TAPE SHOWING IDENTIFICATION MARKS FOR METERS AT THREE DEPTHS



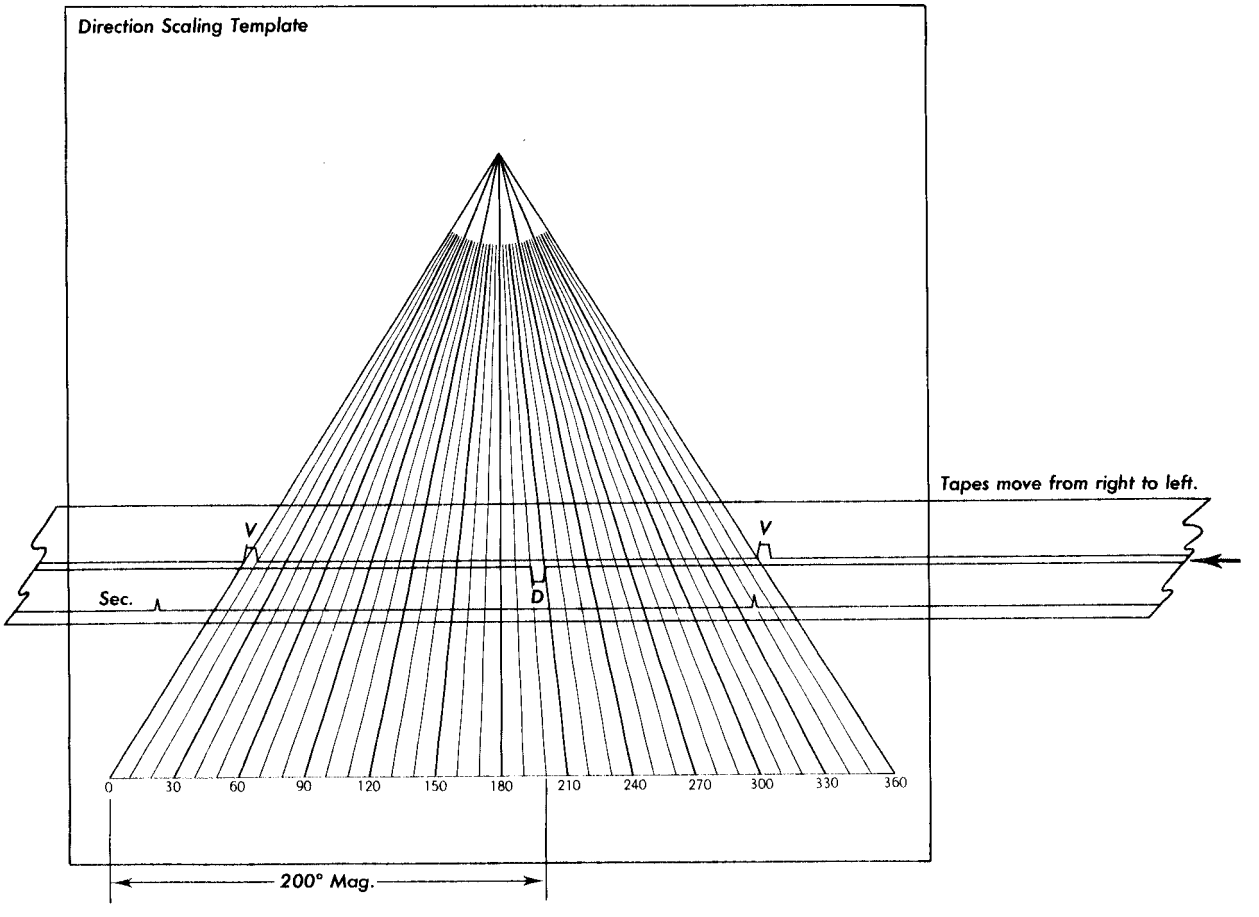
SECTION OF TAPE SHOWING METHOD OF COMPUTING VELOCITY

Total time 8.4 sec.

Total contacts 10

Contact interval 8.4 sec./10=0.84 sec.

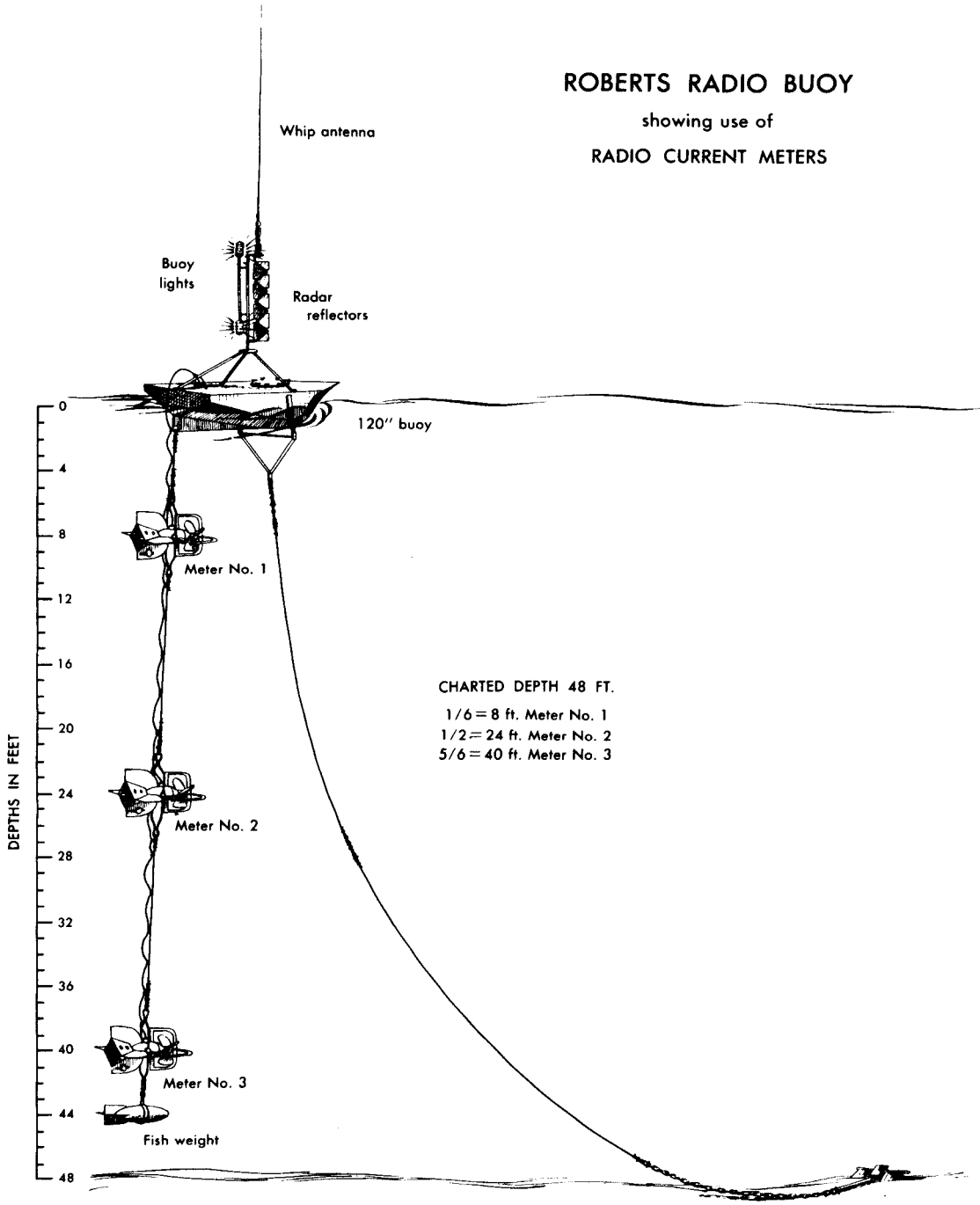
From Rating Table for Roberts current meter, Model III Vel.=4.3 knots



SECTION OF TAPE SHOWING METHOD OF SCALING DIRECTION

Direction=200° Mag. (approx.) (scaled)

Supplement Figure 3.-Tape scaling, Roberts radio current meter, Model III, using "FM" radio gear.



Supplement Figure 4.-Radio buoy showing multi-suspension of Roberts radio current meters.

Contact interval	Velocity	Contact interval	Velocity	Contact interval	Velocity	Contact interval	Velocity
Seconds	Knots	Seconds	Knots	Seconds	Knots	Seconds	Knots
30-16	0.2	2.20- 2.08	1.7	1.14- 1.11	3.2	0.77- 0.76	4.7
15-11.5	0.3	2.07- 1.96	1.8	1.10- 1.08	3.3	0.75	4.8
11.4 - 8.5	0.4	1.95- 1.86	1.9	1.07- 1.05	3.4	0.74- 0.73	4.9
8.4 - 7.0	0.5	1.85- 1.77	2.0	1.04- 1.02	3.5	0.72- 0.71	5.0
6.9 - 5.8	0.6	1.76- 1.69	2.1	1.01- 0.99	3.6	0.70- 0.68	5.2
5.7 - 5.0	0.7	1.68- 1.61	2.2	0.98- 0.97	3.7	0.67- 0.66	5.4
4.9 - 4.4	0.8	1.60- 1.55	2.3	0.96- 0.94	3.8	0.65- 0.64	5.6
4.3 - 3.9	0.9	1.54- 1.48	2.4	0.93- 0.92	3.9	0.63- 0.61	5.8
3.89- 3.50	1.0	1.47- 1.43	2.5	0.91- 0.89	4.0	0.60- 0.59	6.0
3.49- 3.22	1.1	1.42- 1.37	2.6	0.88- 0.87	4.1	0.58- 0.57	6.2
3.21- 2.93	1.2	1.36- 1.32	2.7	0.86- 0.85	4.2	0.56	6.4
2.92- 2.73	1.3	1.31- 1.27	2.8	0.84- 0.83	4.3	0.55- 0.54	6.6
2.72- 2.52	1.4	1.26- 1.23	2.9	0.82- 0.81	4.4	0.53	6.8
2.51- 2.37	1.5	1.22- 1.19	3.0	0.80- 0.79	4.5	0.51	7.0
2.36- 2.21	1.6	1.18- 1.15	3.1	0.78	4.6		

Supplement Figure 5.-Rating table for Roberts radio current meter, Model III.

Contact interval	Velocity	Contact interval	Velocity	Contact interval	Velocity	Contact interval	Velocity
Seconds	Knots	Seconds	Knots	Seconds	Knots	Seconds	Knots
125.0 -46.3	.1	4.22- 4.00	1.8	2.16- 2.11	3.5	1.45- 1.44	5.2
46.2 -28.5	.2	3.99- 3.80	1.9	2.10- 2.06	3.6	1.43- 1.41	5.3
28.4 -20.6	.3	3.79- 3.62	2.0	2.05- 2.00	3.7	1.40- 1.38	5.4
20.5 -16.1	.4	3.61- 3.46	2.1	1.99- 1.95	3.8	1.37- 1.36	5.5
16.0 -13.2	.5	3.45- 3.31	2.2	1.94- 1.90	3.9	1.35- 1.33	5.6
13.1 -11.2	.6	3.30- 3.17	2.3	1.89- 1.85	4.0	1.32- 1.31	5.7
11.1 - 9.73	.7	3.16- 3.04	2.4	1.84- 1.81	4.1	1.30- 1.29	5.8
9.72- 8.60	.8	3.03- 2.93	2.5	1.80- 1.77	4.2	1.28- 1.27	5.9
8.59- 7.70	.9	2.92- 2.82	2.6	1.76- 1.73	4.3	1.26- 1.25	6.0
7.69- 6.97	1.0	2.81- 2.72	2.7	1.72- 1.69	4.4	1.24- 1.23	6.1
6.96- 6.37	1.1	2.71- 2.62	2.8	1.68- 1.65	4.5	1.22- 1.21	6.2
6.36- 5.86	1.2	2.61- 2.53	2.9	1.64- 1.62	4.6	1.20- 1.19	6.3
5.85- 5.44	1.3	2.52- 2.45	3.0	1.61- 1.58	4.7	1.18- 1.17	6.4
5.43- 5.08	1.4	2.44- 2.38	3.1	1.57- 1.55	4.8	1.16- 1.15	6.5
5.07- 4.76	1.5	2.37- 2.30	3.2	1.54- 1.52	4.9	1.14- 1.13	6.6
4.75- 4.48	1.6	2.29- 2.24	3.3	1.51- 1.49	5.0		
4.47- 4.23	1.7	2.23- 2.17	3.4	1.48- 1.46	5.1		

Supplement Figure 6.-Rating table for Roberts radio current meter, Model IV (1/16″ fiberglass impeller and tail fins).

COAST AND GEODETIC SURVEY
Form 270

Current station No.: 1 Date: March 24, 1959 Position angles at station occupied: Tall Hotel Tower Coney I ---- 74°20'
Lookout Tr. Rockaway Pt. -- 23°40'
Tall Tower Rockaway Pt.

General locality: New York Harbor

Description ~~location~~ of station: S.W. of Rockaway Pt. Depth: 48' True bearings of reference objects:

Latitude: 40°32'02"N Longitude: 73°57'20"W Chart 369 Time meridian: 75°W Tide gage at The Battery

TIME	Depth of Meter	Number of Revs.	Time in Seconds	VELOCITY by Meter	VELOCITY by Pole	DIR. OF POLE by Angles, Pelorus or Compass	SHIP'S HEAD by Compass	COMPASS VAR.	COMPASS DEV.	DIR. OF CURRENT		WIND		REMARKS	TAPE #	OBSERV-ERS	
										From Angles	From Pelorus or Compass	Dir.	Vel.				
h. m.	ft.			Knots Tenths	Knots Tenths	°	°	°	°	Mag. True	Mag. True	Mag.	Miles			Obs.	VBY
07 30	8	10	80.0	0 9				11°W		090	079	S	6		1	PR	Jm
32	24	10	99.2	0 7						080	069						
34	40	10	97.5	0 7						085	074						
08 00	8	10	59.3	1 2						095	084	S	8		2	PR	Jm
02	24	10	84.3	0 9						080	069						
04	40	10	78.0	0 9						090	079						
08 30	8	10	53.2	1 4						095	084	8	8		3	PR	Jm
32	24	10	59.5	1 2						090	079						
34	40	10	65.5	1 1						090	079						
09 00	8	10	45.4	1 6						090	079	S	8		4	PR	Jm
02	24	10	56.7	1 3						090	079						
04	40	10	60.9	1 2						085	074						
09 30	8	10	43.3	1 7						095	084	S	8		5	PR	Jm
32	24	10	52.1	1 4						090	079						
34	40	10	64.7	1 1						095	084						
10 00	8	10	44.4	1 7						095	084	SW	5		6	PR	Jm
02	24	10	55.7	1 3						090	079						
04	40	10	64.7	1 1						095	084						

16—20417-1 16—20417-1

Supplement Figure 7.-Completed page from Form 270, "Record of Current Observations."

FORM 451 (10-19-59)

COMPUTATION OF REVERSING CURRENTS

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

Station 3-Rabbit Island Channel, Winyah Bay — T.M. 75°W — Lat. 33°20'22"N — Long. 79°16'53"W

General locality Georgetown, S.C.

Referred to predicted currents at Charleston Harbor, S.C. — Ref. sta. T.M. 75°W — Chart No. 787

Acc. No. T-13015 — Party of C.A. Schoene — Vel. cor. factor $\frac{2.10}{1.66} = 1.27$

Date Year 1958 Month	Day	Instrument and depth	Observed current: Times: Slack before flood h	Strength of flood h	Slack before ebb h	Strength of ebb h	Observed current: Velocities: Strength of flood: Vel. knots	Dir. Mag. true °	Strength of ebb: Vel. knots	Dir. Mag. true °	Reference current: Times: Slack before flood h	Strength of flood h	Slack before ebb h	Strength of ebb h	Reference current: Velocities: Strength of flood knots	Strength of ebb knots	Observed - Reference: Times: Slack before flood h	Strength of flood h	Slack before ebb h	Strength of ebb h
NOV.	20	ROBERTS RCM 6		15.0	18.7	21.2	1.7	358	1.7	242	22.5	12.5	16.4	19.3	1.1	1.9		2.5	2.3	1.9
	21		1.0	3.6	6.9	10.0	1.9	359	1.6	245	11.1	1.1	5.1	7.8	1.3	1.9	2.5	2.5	1.8	2.2
			13.8	16.3	19.7	22.2	1.5	016	1.7	241	23.3	13.4	17.3	20.1	1.1	1.9	2.7	2.9	2.4	2.1
	22		1.8	4.4	7.7	11.0	1.8	010	1.6	244	12.0	1.9	5.9	8.6	1.4	2.0	2.5	2.5	1.8	2.4
			14.5	16.8	19.9	22.6	1.7	015	1.7	245	—	14.2	18.0	20.9	1.2	2.0	2.5	2.6	1.9	1.7
	23		2.5	5.0	8.6	11.5	1.9	018	1.7	240	0.0	2.6	6.6	9.4	1.6	2.1	2.5	2.4	2.0	2.1
			15.5	17.7	21.0	23.8	1.7	016	1.6	239	12.8	15.0	18.7	21.6	1.2	2.0	2.7	2.7	2.3	2.2
	24		3.0	5.6	9.0	12.3	1.8	008	1.7	240	0.7	3.3	7.2	10.2	1.7	2.2	2.3	2.3	1.8	2.1
			16.0								13.4						2.6			
						Sums	14.0	2960	13.3	1936				Sums	10.6	16.0	20.3	20.4	16.3	16.7
						Divisor	8	8	8	8				Divisor	8	8	8	8	8	8
						Means	1.75	010	1.66	242				Means	1.32	2.0	2.54	2.55	2.04	2.09
							2.20(c)		2.12(c)				Gr. Int. Ref. sta.				7.43	10.23	1.20	4.45
													Gr. Int. this sta.				9.97	12.78	3.24	6.54
													M.C.H.					0.37		

Max. Obs Vel. 2.2 knots 023° T (Flood)

Tabulated A.L.L. 3/3/59 ✓ DAD 3/3/59 — Reduced A.L.L. 3/3/59 ✓ DAD 3/3/59

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Supplement Figure 8.-Completed example of Form 451, "Computation of Reversing Currents."